APPENDIX "B"

I-5 Columbia River Crossing
Bridge Influence Area (BIA)
Environmental Qualitative Concept Assessment

Introduction

This section provides a summary of environmental analysis conducted to date on the Columbia River crossing segment of the Portland/Vancouver I-5 Transportation and Trade Partnership project. Specifically, this section describes the analysis conducted and findings identified by the previous studies, and flags potential environmental issues that could deserve special attention during the National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) process.

The following documents were reviewed:

- Portland/Vancouver I-5 Transportation and Trade Partnership Environmental Impact Assessment Draft Report (October 30, 2001)
- Portland/Vancouver I-5 Transportation and Trade Partnership Bridge Influence Area Summary Draft (April 19, 2002)
- Portland/Vancouver I-5 Transportation and Trade Partnership Final Strategic Plan, including Attachment C: Land Use Compatibility of Task Force Recommendations (June 2002)
- Natural Resource Technical Report, I-5 Trade Corridor Study (October 2001)
- Cultural/Historic Resources Technical Report, I-5 Trade Corridor Study (October 2001)
- Land Use Technical Report (including Appendix B Adopted City and Regional Plans) I-5 Trade Corridor Study (October 2001)
- Portland/Vancouver I-5 Transportation and Trade Partnership Air Quality Screening Analysis Summary (November 2001)

The scope of this analysis is the Bridge Influence Area (BIA) described in the BIA Summary Draft Report. The BIA is considered to be the I-5 freeway between SR 500 in Vancouver and Columbia Boulevard in Portland.

This section analyzes the eight concepts evaluated in the BIA Summary Report. The section organizes itself by environmental discipline and, where possible, it differentiates impacts among the various alternatives.

Review of Environmental Analysis Conducted to Date

A cursory level of environmental analysis was conducted for both the BIA Summary report and the Environmental Impact Assessment (EIA). The BIA addressed eight concepts that

looked specifically at the Columbia River crossing, and the EIA addressed six corridor-length options.

The two reports are related. The BIA Summary report, published in April 2002, elaborates on the findings from the October 2001 EIA, analyzing in greater detail the impacts associated with various river crossing concepts. However, specific land use analysis for the BIA was also included in the earlier-published EIA and its background technical reports. Although neither the methodology nor the findings between the EIA and the BIA Summary Reports are identical, the EIA and its background technical reports were reviewed as well.

Although both documents evaluated the river crossing, some translation needs to occur between the terminology used to explain the concepts in the two documents. Table 1 below provides a comparison.

TABLE 1
Comparison of BIA Concepts and EIA Options

BIA Concept No.	EIA Option No.	EIA Option Name
Concept 1	Option 6	Express Bus with Capacity Increase - 4 Lane Supplemental
Concept 2		
Concept 3		
Concept 4	Option 6	Express Bus with Capacity Increase - 10 Lane Replacement
Concept 5		
Concept 6	Option 3C Option 6 Option 8	LRT/Arterial HOV Express Bus with Capacity Increase - 4 Lane Supplemental West Arterial Road
Concept 7	Option 6	Express Bus with Capacity Increase - 6 Lane Supplemental
Concept 8		

Land Use

Environmental analysis was performed at a cursory level for both the EIA and the BIA Summary document. The methodology used for both analyses was to overlay project design details onto maps containing land use information from regional metropolitan Geographic Information Systems (GIS) databases. Two forms of impacts were identified:

- Displacements were defined as those parcels where the concept impacted the entire parcel and/or part of the structure.
- Encroachments were defined as those parcels where the concept affected a portion of a parcel but the remaining property was likely to remain useful to the property owner.

BIA Concept 1

BIA Concept 1 consists of five northbound lanes on the existing bridges, and the construction of a new double-decker bridge west of the existing structures, with five southbound lanes on the upper deck and light-rail transit (LRT) on the lower deck. The new

bridge would be a low- to mid-span level bridge, with a lift span over the existing navigation channel. The BIA Summary report identified the following potential land use impacts associated with BIA Concept 1.

TABLE 2
BIA Concept 1: Potential Property Displacements and Encroachments

	Residential	Non-Residential
Displacements		
Vancouver	0	0
Portland	8	16
Total	*8*	*16*
Encroachments		
Vancouver	21	15
Portland	0	17
Total	*21*	*32*

There are 77 potential property impacts identified with this concept.

EIA Option 6 (4-Lane Supplemental Bridge)

The EIA Option 6 "Express Bus with Capacity Increase" also looked at the option of adding a four-lane supplemental bridge over the Columbia River. This is similar though not identical to the BIA Concept 1. Impacts identified with the 4-lane supplemental bridge variation of EIA Option 6 are actually quite different from the BIA Summary report. These are highlighted in Table 3 below.

TABLE 3
EIA Option 6, 4-Lane Supplemental Bridge Variation: Potential Property Displacements and Encroachments

	Residential	Non-Residential
Displacements		
Vancouver	0	0
Portland	15	9
Total	*15*	*9*
Encroachments*		
Vancouver	6	
Portland	22	
Total	*28*	

* The EIA did not separate residential from non-residential encroachments

Both the BIA Summary report and the EIA identified 24 potential displacements associated with adding a 4-5 lane supplemental bridge to the existing river crossing, though the BIA report identified 8 residential and 16 non-residential impacts, though the EIA identified 15 residential and 9 non-residential impacts. The design differences that would result in these discrepancies are not clear.

A plan and policy review matrix was developed as an appendix to the land use technical report which analyzed each corridor-long EIA option against a series of local and regional plans and policies. BIA-specific analysis was not available. The options were found to be generally consistent with state, regional, and local plans and policies, however some potential conflicts were identified which could require further analysis for avoidance or mitigation opportunities. Specific conflicts related to EIA Option 6 include:

- Adopted Humboldt Neighborhood Plan, Policy 1, Objective 5, Neighborhood Livability
- City of Portland Comprehensive Plan, Transportation Element, Policy 6.18, Clean Air and Energy Efficiency
- City of Portland Central City Transportation Management Plan, Policy 9.1, Air Quality
- Albina Community Plan, Policy II, Objective 5, Transportation
- Visions for the Vancouver Urban Area, Policy P52, Land Use
- Visions for the Vancouver Urban Area, Policy P102, Mobility Management
- Regional Framework Plan, Policy 2.26.3, Clean Air

A revised plan and policy review would be needed to capture new or updated local or regional plans, in relation to the specific BIA Concepts.

BIA Concept 2

BIA Concept 2 includes a five-lane supplemental bridge east of the existing bridges and a separate LRT bridge to the west. Northbound traffic would flow on the new five-lane bridge, and southbound traffic would be split between the two existing bridges. BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7. As discussed in a later section, BIA Concept 7 is anticipated to have 43 displacements and 59 encroachments.

BIA Concept 3

BIA Concept 3 consists of ten lanes on a new five-lane double-deck low- to mid-level bridge, with LRT retrofitted on the existing bridge crossings. The new bridge would have a lift span over the existing navigation channel. BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 was discussed in a previous section.

BIA Concept 4

This concept includes the replacement of the existing bridges with two new bridge structures. One bridge would be a ten-lane double-decker bridge (five southbound lanes on the lower deck, five northbound lanes on the upper deck). The other new bridge, west of

the existing bridges, would contain LRT only. Both structures would be mid- to high-level bridges. The navigation channel would be relocated to the center of the river. This is the only option to shift the navigational channel. Both structures are potentially fixed or lift spans. Potential property impacts from this concept are summarized in Table 4 below.

TABLE 4
BIA Concept 4: Potential Property Displacements and Encroachments

	Residential	Non-Residential
Displacements		
Vancouver	0	1
Portland	6	8
Total	*6*	*9*
Encroachments		
Vancouver	9	8
Portland	0	27
Total	*9*	*35*

BIA Concept 4, which replaces the current bridge structure with a replacement bridge, has the least number of likely property impacts (15 potential displacements and 44 potential encroachments). This is because the structure would follow near the existing bridge and freeway alignment, and creates a five-lane footprint for vehicle travel, by decking the southbound movement on top of the northbound.

EIA Option 6 (10-Lane Replacement Bridge)

EIA Option 6 "Express Bus with Capacity Increase" also looked at possibly replacing the existing bridge structure with a new bridge. This option did not consider a double-decked bridge and therefore identified impacts associated with a new ten-lane structure. Even so, the identified impacts were anticipated to be less than those identified in the BIA Summary report. This may be due to more information available for the BIA Summary report, or a difference in design location. See Table 5 below.

TABLE 5
EIA Option 6, 10-Lane Bridge Replacement Variation: Potential Property Displacements and Encroachments

	Residential	Non-Residential
Displacements		
Vancouver	0	0
Portland	0	9
Total	*0*	*9*

TABLE 5
EIA Option 6, 10-Lane Bridge Replacement Variation: Potential Property Displacements and Encroachments

Encroachments*	
Vancouver	12
Portland	20
Total	*22*

* The EIA did not separate residential from non-residential encroachments

A plan and policy review matrix was developed as an appendix to the land use technical report. Specific conflicts related to EIA Option 6 were summarized earlier in this report, under BIA Concept 1.

BIA Concept 5

Concept 5 consists of a new six-lane supplemental bridge to the east of the existing structures, to accommodate through traffic. The existing bridge crossings would be used for collector-distributor movement. Another new structure would be built to the west of the existing structures to accommodate LRT. Concept 5 was not analyzed in the Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

Concept 6 uses the existing bridge structure in the same manner used today. It constructs a new, low- to mid-level bridge structure to the west of the existing one with a 4-lane collector-distributor on the top level and LRT on the lower level. The bridge requires fly-over ramps to the north and south for ramp access.

TABLE 6
BIA Concept 6: Potential Property Displacements and Encroachments

	Residential	**Non-Residential**
Displacements		
Vancouver	0	2
Portland	20	21
Total	*20*	*23*
Encroachments		
Vancouver	15	26
Portland	1	17
Total	*16*	*43*

R = Residential
NR = Non-Residential

The BIA Summary report projected approximately 43 displacements and 59 encroachments associated with Concept 6.

Three Options considered in the EIA – Option 3C, Option 6 (with 4-lane supplemental bridge) and Option 8 have a similar footprint to the BIA Concept 6. Option 3C added a new joint-use arterial/LRT bridge across the Columbia River. Option 6 contained a variation of a 4-lane supplemental bridge. Option 8 added a new four-lane arterial road plus bike lanes and sidewalks crossing the Columbia river. Anticipated environmental impacts associated with Option 6 with the 4-lane supplemental bridge are described under BIA Concept 1. Information in the EIA related to these other two options are described below.

Option 3

A plan and policy review matrix was developed as an appendix to the land use technical report. The matrix analyzed each corridor-long EIA option against a series of local and regional plans and policies. BIA-specific analysis was not available. The options were found to be generally consistent with state, regional, and local plans and policies, however some potential conflicts were identified which could require further analysis for avoidance or mitigation opportunities. Specific conflicts related to EIA Option 3 include:

- City of Portland Comprehensive Plan, Transportation Element, Policy 6.24 Land Use
- 2000 Regional Transportation Plan, Policy 7.0 The Natural Environmental
- 2000 Regional Transportation Plan, Policy 8.0 Water Quality
- City of Portland Comprehensive Plan Goals and Policies, Goal 4.2 Land Use/Livability
- City of Portland Comprehensive Plan Goals and Policies, Goal 8.15 Wetlands/Riparian/Water Bodies Protection
- Clark County 20-Year Comprehensive Growth Management Plan, Goal 2.4, Environmental
- Clark County 20-Year Comprehensive Growth Management Plan, Goal 8.3, Regional Conservation and Greenway Systems
- Visions for the Vancouver Urban Area, P19, P20, P21, and P23 Sensitive Lands
- Visions for the Vancouver Urban Area, P52 and P53 Land Use
- Regional Framework Plan, Policy 2.4.4 Environmental System Objectives
- Regional Framework Plan, Policy 2.24.1, 2.24.2, and 2.24.3Natural Environment
- Regional Framework Plan, Policy 4.6 Water Quality

A plan and policy review would be needed to capture new or updated local or regional plans, in relation to the specific BIA Concepts.

Option 8

The Land Use technical report noted that Option 8 would require a new road that would affect wetlands and other habitat areas, which would conflict with adopted environmental

goals. Depending on the location of the arterial bridge, the lower noise, traffic, and air quality impacts on land uses adjacent to I-5 are offset by potentially increased traffic, noise, and air quality impacts in the vicinity of North Portland Road, also providing a potential conflict.

As an appendix to the technical report, a plan and policy review matrix was developed that analyzed each corridor-long EIA option against a series of local and regional plans and policies. The options were found to be generally consistent with state, regional, and local plans and policies, however some conflicts were identified. Specific conflicts listed in the appendix related to EIA Option 8 include:

- City of Portland Comprehensive Plan, Transportation Element, Policy 6.3
- City of Portland Comprehensive Plan, Land Use Element, Policy 6.8
- City of Portland Comprehensive Plan, Land Use Element, Policy 6.24
- 2000 Regional Transportation Plan, Policy 7.0 The Natural Environment
- 2000 Regional Transportation Plan, Policy 8.0 Water Quality
- 2000 Regional Transportation Plan, Policy 19.2 Transportation
- 2000 Regional Transportation Plan, Policy 20.2 Environmental
- Metro 2040 Growth Concept, Objective 14.2 Environmental Considerations
- Portland Comprehensive Plan Goals and Policies, Goal 8.14 Natural Resources
- Portland Comprehensive Plan Goals and Policies, Goal 8.15 Wetlands/Riparian/Waterbodies Protection
- Portland Comprehensive Plan Goals and Policies, Goal 8.16 Uplands Protection
- Portland Comprehensive Plan Goals and Policies, Goal 12.6 Land Use/Livability
- Salmon Creek/Fairgrounds Regional Road Plan, Objective T-2, Policy 2, Improve Existing Roadways
- Visions for the Vancouver Urban Area, Policy P52 Land Use
- Regional Framework Plan, Policy 2.4.4, Environmental System Objectives
- Regional Framework Plan, Policy 2.24.1 and 2.24.3, Natural Environment
- Regional Framework Plan, Policy 3.2.6, Protection of Regionally Significant Parks, Natural Areas, Open Spaces, Trails, and Greenways
- Regional Framework Plan, Policy 4.6, Water Quality
- Regional Framework Plan, Policy 4.16, Urban Planning and Natural Systems

A plan and policy review would be needed to capture new or updated local or regional plans, in relation to the specific BIA Concepts.

BIA Concept 7

Concept 7 uses existing structures to accommodate three southbound lanes (west bridge) and northbound and southbound HOV movement (east bridge). There is also potential for the east bridge structure to serve as express lanes or reversible lanes. Under Concept 7, two new low- to mid-level bridge structures with lift spans would be constructed. The first structure, to the east of the HOV bridge, would contain three northbound lanes. The second structure, to the west of the southbound movement, would contain two arterial lanes and LRT. See Table 7 below.

TABLE 7
BIA Concept 7: Potential Property Displacements and Encroachments

	Residential	Non-Residential
Displacements		
Vancouver	0	0
Portland	6	17
Total	*6*	*17*
Encroachments		
Vancouver	13	10
Portland	0	19
Total	*13*	*29*

The BIA Summary report anticipated 23 displacements and 42 encroachments associated with Concept 7.

The 6-lane supplemental bridge variation of EIA Option 6 is similar though not identical to BIA Concept 7. Impacts identified with the 4-lane supplemental bridge variation of EIA Option 6 are different from the BIA Concept 7. See Table 8.

TABLE 8
EIA Option 6, 6-Lane Supplemental Bridge Variation: Potential Property Displacements and Encroachments

	Residential	Non-Residential
Displacements		
Vancouver	0	3
Portland	0	4
Total	*0*	*7*
Encroachments*		
Vancouver	12	
Portland	12	

TABLE 8
EIA Option 6, 6-Lane Supplemental Bridge Variation: Potential Property Displacements and Encroachments

Total	*24*

* The EIA did not separate residential from non-residential encroachments

The EIA anticipated 7 displacements and 24 encroachments associated with a six-lane supplemental bridge crossing. It is not clear whether this is due to a change in methodology to assessing land use impacts, or a shift in design footprint.

BIA Concept 8

Concept 8 consists of an eight-lane low- to mid-level supplemental bridge east of the existing bridges, LRT retrofit on the existing southbound bridge, and a two-lane arterial on the existing northbound bridge.

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Land Use Issues

A thorough land use analysis will be undertaken when this project moves into the NEPA process, which will include an inventory of current land uses and current zoning and comprehensive plan designations, a description of development projects planned and underway, and a detailed analysis of how each project concept would directly or indirectly affect land uses in the study area as well as its compatibility with adopted local, regional, and state plans. Some considerations for the EIS process as related to land use include:

- *Statewide Plan Compliance* – No exceptions to the statewide planning goals are expected, though a more thorough analysis will need to occur prior to or during the NEPA process. A goal exception would have necessary budget and schedule impacts. The options evaluated in the EIA are considered generally consistent with the Oregon Highway Plan. In Washington, the state's Growth Management Act is implemented through regional comprehensive and transportation plans, which are discussed below.
- *Regional Plan Compliance* – According to the Final Strategic Plan, all Concepts considered in the EIA support the Metro 2040 Growth Concept, Metro's Regional Transportation Plan, Clark County Comprehensive Plan, and the Clark County Metropolitan Transportation Plan by reducing delay and congestion in the I-5 Corridor and improving bi-state transit service.
- *Local Plan Compliance* – Overall, the concepts evaluated in the EIA are considered compatible with the City of Portland Comprehensive Plan. Expected impacts from this project to environmentally sensitive areas are likely to conflict with adopted environmental policies from the City of Portland Comprehensive Plan, the Columbia South Shore Natural Resource Protection Plan, and other similar plans, though impact avoidance, minimization, and mitigation is a likely objective during the design phase. In Washington, all Concepts are consistent overall with the Visions for the Vancouver Urban Area, though Option 3C conflicts with environmental policies related to sensitive

lands, and Options 3C, 6, and 8 conflict with the plan's land use policy related to protecting sensitive lands from incompatible land uses. Option 6 may conflict with mobility management policy to reduce the total number of average daily traffic trips throughout the Vancouver urban area. These conflicts would need to be addressed through the project's design phase and NEPA process.

- *Impacts to Industrial Land Uses* – The project is likely to result in several acres of direct impacts to existing and zoned industrial land uses. Identifying similarly sized, zoned, and available parcels within the study area may be difficult, and could result in an undue impact on this land use.
- *Impacts to Residential Land Uses* – densely populated neighborhoods are located along the BIA, especially at the southern and northern edges. Displacements of single-family and multi-family residential parcels will require an assessment of other similarly valued and available parcels within the study area. Increased land values around interchanges could create pressure to change zoning from residential to commercial or industrial.
- *Development Pressure*– There may be some development pressure around the interchanges in the BIA that could increase demands on the freeway system.
- *Tunneling* – if a tunneling option were pursued, substantial amounts of land would be required on both sides of the Columbia River for launching and landing the cars.

Socioeconomics

The BIA Summary Report did not describe any additional socioeconomic analysis over and above what was included in the EIA. However, some discussion of neighborhood impacts was included in the EIA. Those neighborhoods within the bridge study area include Hayden Island and Kenton/Bridgeton in Oregon, and Hudson's Bay/Central Park, Esther Short, Arnada, Rosemere, and Shumway in Washington. Neighborhood impacts were determined by overlaying project design details onto maps containing land use information from regional metropolitan Geographic Information Systems (GIS) databases. Two forms of impacts were identified:

- Displacements were defined as those parcels where the concept impacted the entire parcel and/or part of the structure.
- Encroachments were defined as those parcels where the concept affected a portion of a parcel but the remaining property was likely to remain useful to the property owner.

BIA Concept 1

BIA Concept 1 is the only concept of the four analyzed that does not encroach into the Delta Park greenspace area.

EIA Option 6 "Express Bus with Capacity Increase" (four-lane)

The Land Use technical report did not identify potential neighborhood impacts for the four-lane supplemental bridge variation of EIA Option 6. However, the EIA Environmental Justice section does call out that information, as shown in the table below.

TABLE 9
Land Use Technical Report, Option 6, 4-Lane Supplemental Bridge Variation: Potential Neighborhood Impacts

Neighborhood	Full and Partial Property Impacts
Kenton/Bridgeton	16
Hayden Island	30
Rosemere	27
Hudson's Bay/Central Park	0
Shumway	16
Arnada	9
Esther Short	6
TOTAL	*104*

BIA Concept 2

BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7, as discussed in a later section.

BIA Concept 3

BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 is discussed above.

BIA Concept 4

BIA Concept 4 encroaches into the Delta Park greenspace area (between 60 and 120 feet). If a park resource is impacted, federal regulations would require a Section 4(f) analysis to determine that there are no feasible or prudent concepts before mitigation could be determined.

EIA Option 6 "Express Bus with Capacity Increase" (ten-lane)

Neighborhood impacts within the project area for the 10-lane bridge replacement option are described in Table 10 below:

TABLE 10
Land Use Technical Report, Option 6, 10-Lane Bridge Replacement Variation: Potential Neighborhood Impacts

Neighborhood	Full and Partial Property Impacts
Kenton/Bridgeton	15
Hayden Island	18
Rosemere	24
Hudson's Bay/Central Park	12

TABLE 10
Land Use Technical Report, Option 6, 10-Lane Bridge Replacement Variation: Potential Neighborhood Impacts

Neighborhood	Full and Partial Property Impacts
Shumway	16
Arnada	0
Esther Short	2
TOTAL	*87*

The majority of impacts occur to commercial and industrial properties.

BIA Concept 5

Concept 5 was not analyzed in the Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

BIA Concept 6 encroaches into the Delta Park greenspace area (between 60 and 120 feet). If a park resource is impacted, federal regulations (Section 4(f)) would require that there are no feasible or prudent concepts before mitigation could be determined.

EIA Option 3

Neighborhood impacts within the study area associated with Option 3 are as follows:

TABLE 11
Land Use Technical Report, Option 3: Potential Neighborhood Impacts

Neighborhood	Full and Partial Property Impacts
Kenton/Bridgeton	20
Hayden Island	20
Rosemere	0
Hudson's Bay/Central Park	8
Shumway	0
Arnada	6
Esther Short	15
TOTAL	*69*

Option 8

Neighborhood impacts within the study area associated with Option 8 include impacts to 12 parcels, mainly commercial and rural, on Hayden Island and impacts to 28 parcels, mainly

industrial, in Kenton/Bridgeton. In Washington, 4 properties, all industrial, are expected to be impacted in the study area. These all occur in the Esther Short neighborhood.

BIA Concept 7

BIA Concept 7 encroaches into the Delta Park greenspace area (between 60 and 120 feet). If a park resource is impacted, federal regulations (Section 4(f)) would require that there are no feasible or prudent concepts before mitigation could be determined.

Option 6 (6-Lane Supplemental Bridge)

Neighborhood impacts within the project area for EIA Option 6 with a six-lane supplemental bridge are described in Table 12 below:

TABLE 12
Land Use Technical Report, Option 6, 6-Lane Supplemental Bridge Variation: Potential Neighborhood Impacts

Neighborhood	Impacts
Kenton/Bridgeton	14
Hayden Island	10
Rosemere	24
Hudson's Bay/Central Park	12
Shumway	16
Arnada	9
Esther Short	3
TOTAL	*88*

The majority of impacts are anticipated to occur to commercial and industrial properties.

BIA Concept 8

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Socioeconomics Issues

Additional analysis of neighborhood impacts associated with each concept under consideration would need to be undertaken as part of the NEPA process. Some issues that may arise in this subject area include:

- *Neighborhood Cohesion* – how does the displacement of residential properties affect the cohesiveness of the study neighborhoods? This is of special concern on the Vancouver side of the project area.
- *Travel Patterns* – a large number of commercial and industrial parcels were projected to be displaced by the various concepts. This may affect the travel patterns of

neighborhood residents, forcing them to travel farther for employment, or to run errands.

- *Traffic* – Further analysis will need to be done to determine the extent of potential traffic cut-through on neighborhood streets. This could cause a safety problem and/or a noise problem.
- *Pressure to Change Zoning* – There may be some pressure to change zoning from industrial to commercial in the study area.

Environmental Justice

The BIA Summary Report did not include any specific analysis related to Environmental Justice, though this analysis was conducted for the EIA. Earlier in this report, the EIA Options were translated into those BIA Concepts they best reflected. This format is followed through the discussion below.

The EIA stated a goal of avoiding, minimizing, or mitigating disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations, and of preventing the delay of receipt of benefits by these same groups.

The environmental justice section of the EIA identified those neighborhoods within the study area that were (1) low income and minority; (2) low income or minority; or (3) neither low income nor minority. Table 13 describes the seven neighborhoods within the BIA in terms of these three environmental justice categories:

TABLE 13
Neighborhoods within the BIA

Neighborhood	State	Low Income	Minority
Shumway	Washington	Yes	No
Rosemere	Washington	Yes	Yes
Arnada	Washington	Yes	Yes
Esther Short	Washington	Yes	Yes
Hudson's Bay/Central Park	Washington	Yes	Yes
Hayden Island	Oregon	No	No
Kenton/Bridgeton	Oregon	No	No

The Environmental Justice analysis analyzed project impacts by neighborhood to discern any disproportionate impacts to minority or low-income neighborhoods.

It should be noted that the Environmental Justice analysis conducted for the EIA is incomplete and now out-of-date. Though it serves a descriptive value, it should not be relied upon in future analyses.

BIA Concept 1

The BIA Summary Report did not outline displacements and encroachments by neighborhood. This Concept is most similar to EIA Option 6 (four-lane supplemental bridge), which is described below.

EIA Option 6 "Express Bus with Capacity Increase" (four-lane supplemental bridge)

The Shumway, Rosemere, and Arnada neighborhoods experienced a large decrease in auto travel times (greater than 10 percent) with Option 6. This is a positive benefit. No neighborhoods were observed as having significantly increased travel times under this option.

TABLE 14
Option 6 4-Lane Supplemental Bridge Displacements/Encroachments to Neighborhoods within BIA

Neighborhood	EJ Category	No. Displacements	No. Encroachments
Shumway	Low Income	2 residential	14
Rosemere	Low Income, Minority	27 residential	0
Arnada	Low Income, Minority	3 residential	6
Esther Short	Low Income, Minority	0	6
Hudson's Bay/Central Park	Low Income, Minority	0	0
Hayden Island	Neither Low Income nor Minority	15 residential 7 non-residential 2 public/open space	6
Kenton/Bridgeton	Neither Low Income nor Minority		16

The greatest number of displacements associated with this option are to Rosemere, which is a low income, minority neighborhood. Rosemere is expected to experience 27 residential displacements as a result of this option. The neighborhood with the second highest number of impacts is Hayden Island, which is neither low income nor minority. Hayden Island is expected to experience 15 residential and 7 non-residential displacements, plus 6 encroachments from this option.

BIA Concept 2

BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7. As discussed in a later section.

BIA Concept 3

BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 was discussed in a previous section.

BIA Concept 4

The BIA Summary Report did not outline displacements and encroachments by neighborhood. This Concept is most similar to EIA Option 6 (ten-lane replacement bridge), which is described below.

EIA Option 6 "Express Bus with Capacity Increase" (ten-lane replacement bridge)

The Shumway, Rosemere, and Arnada neighborhoods experienced a large decrease in auto travel times (greater than 10 percent) with Option 6. This is a positive benefit. No neighborhoods were observed as having significantly increased travel times under this option.

TABLE 15
Option 6 10-Lane Replacement Bridge Displacements/Encroachments to Neighborhoods within BIA

Neighborhood	Status	No. Displacements	No. Encroachments
Shumway	Low Income	2 residential	14
Rosemere	Low Income, Minority	27 residential	0
Arnada	Low Income, Minority	3 residential	6
Esther Short	Low Income, Minority	0	2
Hudson's Bay/Central Park	Low Income, Minority	2 public/open space	10
Hayden Island	No special status	0	12
Kenton/Bridgeton	No special status	0	8

Although Hayden Island avoids any displacements with this option (as opposed to the four-lane bridge variation), the impacts to the low income, minority Rosemere neighborhood remain the same, at 27 residential displacements.

BIA Concept 5

Concept 5 was not analyzed in the Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

The BIA Summary Report did not outline displacements and encroachments by neighborhood. This Concept is most similar to EIA Option 3C Light Rail Loop and Option 8 West Arterial Road, which are described below.

EIA Option 3C Light Rail

The Rosemere, and Esther Short neighborhoods experienced a large decrease in auto travel times (greater than 10 percent) associated with Option 3 (positive benefit). No neighborhoods within the BIA were observed as having significantly increased travel times under this option.

TABLE 16
Option 3 Light Rail – Displacements/Encroachments to Neighborhoods within BIA

Neighborhood	Status	No. Displacements	No. Encroachments
Shumway	Low Income	0	0
Rosemere	Low Income, Minority	29 residential	10
Arnada	Low Income, Minority	2 non-residential	4
Esther Short	Low Income, Minority	2 non-residential	10
Hayden Island	No special status	7 residential 4 non-residential 1 public/open space	10
Kenton/Bridgeton	No special status	0	0

Option 8 West Arterial Road

The West Arterial Road option showed a decrease in travel time greater than 10 percent (greater benefit) for two neighborhoods in Vancouver within the BIA, Rosemere and Shumway. No neighborhoods experienced an increase in travel time greater than 10 percent for this option.

Several residential displacements and encroachments take place under this option, though due to the construction of a new arterial roadway to connect Vancouver with the Northwest Industrial District most of those displacements occur outside the BIA neighborhoods (e.g., St. John's, Northwest Industrial). These impacts to neighborhoods within the BIA are listed as follows:

TABLE 17
Option 8 West Arterial Road Displacements/Encroachments to Neighborhoods within BIA

Neighborhood	Status	No. Displacements	No. Encroachments
Shumway	Low Income	0	0

TABLE 17
Option 8 West Arterial Road Displacements/Encroachments to Neighborhoods within BIA

Neighborhood	Status	No. Displacements	No. Encroachments
Rosemere	Low Income, Minority	0	0
Arnada	Low Income, Minority	0	0
Esther Short	Low Income, Minority	0	0
Hudson's Bay/Central Park	Low Income, Minority	0	0
Hayden Island	No special status	1 non-residential	22
Kenton/Bridgeton	No special status	0	7

No displacements or encroachments to low income or minority neighborhoods within the BIA are expected to occur under Option 8.

BIA Concept 7

The BIA Summary Report did not outline displacements and encroachments by neighborhood. This Concept is most similar to EIA Option 6 (six-lane supplemental bridge), which is described below.

Option 6 (6-Lane Supplemental Bridge)

The Shumway, Rosemere, and Arnada neighborhoods experienced a greater than 10 percent decrease in auto travel times with Option 6 (positive benefit). No neighborhoods were observed as having significantly increased travel times under this option.

Table 18 below outlines impacts to environmental justice neighborhoods within the BIA associated with the six-lane bridge variation of Option 6.

TABLE 18
Option 6 6-Lane Supplemental Bridge Displacements/Encroachments to Neighborhoods within BIA

Neighborhood	Status	No. Displacements	No. Encroachments
Shumway	Low Income	2 residential	14
Rosemere	Low Income, Minority	27 residential	
Arnada	Low Income, Minority	3 residential	6
Esther Short	Low Income, Minority	0	3
Hudson's Bay/Central Park	Low Income, Minority	1 non-residential 2 public/open space	9
Hayden Island	No special status	3 non-residential	3

TABLE 18
Option 6 6-Lane Supplemental Bridge Displacements/Encroachments to Neighborhoods within BIA

Neighborhood	Status	No. Displacements	No. Encroachments
Kenton/Bridgeton	No special status	1 non-residential	9

As with the other variations of Option 6, the Rosemere neighborhood experiences far more residential displacements than the other neighborhoods. The Shumway and Hudson's Bay/Central Park neighborhoods see a number of encroachments (14 and 9 respectively).

BIA Concept 8

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Environmental Justice Issues

It should be noted that the Environmental Justice analysis conducted for the EIA is incomplete and now out-of-date. Though it serves a descriptive value, it should not be relied upon in future analyses.

Additional analysis on environmental justice associated with each concept under consideration would be undertaken as part of the NEPA process. Some issues that may arise in this subject area include:

- *Residential Displacements* – all of the neighborhoods on the Washington side of the BIA are identified as low income or low income and minority. Special attention will need to be paid to residential impacts to these neighborhoods to ensure that disproportionate impacts do not occur.
- *Commercial, Industrial, and Open Space Displacements* – similar to the bullet point above, special attention will need to be paid to ensure that disproportionate impacts do not occur for low income or minority residents in terms of access to jobs, recreation, and services.

Cultural Resources

The BIA Summary report limited its screening of potential impacts to historic resources to the consideration of the Fort Vancouver National Historic site, the Columbia Cemetery located north of Columbia Boulevard and east of I-5, and the existing I-5 Columbia River Bridges.

The EIA and its Cultural Resources technical report analyzed all properties 500 feet from the widest point of each side of each proposed option disturbance area, as well as any properties with historic designations adjacent to this buffer area. No field surveys or historic research were completed. Databases were queried for information on historic and culturally significant properties within the study area. These included the National Register of Historic Places (NRHP), the Washington Office of Archaeology and Historic Preservation (Washington OAHP), and the Oregon State Historic Preservation Office (Oregon SHPO).

Locations of historic properties were mapped using GIS, and overlaid onto a map showing design details for all options being analyzed to determine direct, major, minor, or indirect impacts. Direct impacts were defined as full acquisition of the parcel; major impacts were defined as requiring acquisition of half or more of the parcel; and minor impacts were defined as requiring less than half of the parcel. Indirect impacts were defined as where nearby construction or project-related disturbance could have an affect on the quality of life.

BIA Concept 1

BIA Concept 1 has an encroachment onto the Ft. Vancouver Historical Site (between 60-120 feet). An encroachment over 60' would impact the FHWA building located near the SR 14 ramp to I-5 northbound. However, no historic buildings would be impacted. This concept includes a new bridge structure to the east of the existing bridges. This minimizes the impacts to the Fort Vancouver Historic Site, in comparison to concepts with a structure to the west of the existing bridges.

This concept would impact the Historic I-5 Columbia River Bridge, though not to the extent of Concept 4 which replaces the historic structure. The existing northbound bridge is registered on the National Register of Historic Places and the southbound bridge is eligible for registration.

This concept would require evaluation to determine if the new bridge structure substantially impairs the historic integrity of the historic bridges.

EIA Option 6 "Express Bus with Capacity Increase" (four-lane)

As noted in previous sections, EIA Option 6 (four-lane bridge variation) is closest in footprint to BIA Concept 1. The EIA was more specific than the BIA Summary report in listing potential historic impacts.

Although the BIA report indicated no impacts to historic structures, the EIA indicated that the House of Providence and the Fort Vancouver National Historic Site are two properties in Washington likely to experience minor impacts under Option 6 (4-Lane). The House of Providence was added to the NRHP in 1978 and its significance is largely due to its architecture. The EIA stated that it is unlikely that the small portion of property required for new right-of-way would adversely impact the architectural character of the property.

In Oregon, The Columbia River Interstate Bridge and the Columbia Cemetery are likely to experience indirect impacts associated with nearby construction activity or other work-related activities. The Columbia Cemetery is listed on the City of Portland's Historic Landmarks Register, is designated as historically significant by the City of Portland, and is notable because it is one of the few existing pioneer cemeteries. Indirect impacts would not affect the essential historic qualities that qualify this property for historic status.

BIA Concept 2

BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 3

BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 was discussed in a previous section.

BIA Concept 4

BIA Concept 4 is likely to result in an encroachment onto the Ft. Vancouver Historical Site (60-120 feet). An encroachment over 60' would impact the FHWA building located near the SR 14 ramp to I-5 northbound. However, no historic buildings would be impacted. This Concept, by fully replacing the I-5 Columbia River Bridge with a replacement bridge, has the greatest impact of all the BIA concepts to this historic structure. The existing northbound bridge is registered on the National Register of Historic Places and the southbound bridge is eligible for registration.

EIA Option 6 "Express Bus with Capacity Increase" (ten-lane)

As discussed in a previous section, EIA Option 6 (10-Lane Variation) is most similar to BIA Concept 4. Impacts discussed in the EIA under this variation of Option 6 are as follows.

Although the BIA report indicates no likely impacts to historic structures, the EIA indicates this option may have indirect impacts to Kiggins House. The Kiggins House was added to the NRHP in 1995, for its association with significant historical figures. It is unlikely that the indirect impacts associated with this option would adversely impact the historical site.

The House of Providence (described under BIA Concept 1) may also experience indirect impacts. The Columbia River Interstate Bridge would be fully removed under this option, creating a direct impact to the structure. The Columbia Cemetery is likely to experience indirect impacts associated with this option.

This option directly conflicts with Oregon state and local historic preservation policies, as it would result in the removal of the historic bridges. Pursuit of this option would necessitate a Section 106 and Section 4(f) process. This process would also be followed for impacts to the Kiggins House.

BIA Concept 5

Concept 5 was not analyzed in the BIA Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

BIA Concept 6 has an encroachment onto the Ft. Vancouver Historical Site (60-120 feet). An encroachment over 60' would impact the FHWA building located near the SR 14 ramp to I-5 northbound. However, the BIA Summary Report indicates that no historic buildings would be impacted. This concept includes a new bridge structure to the east of the existing bridges. This minimizes the impacts to the Fort Vancouver Historic Site in comparison to concepts with a structure to the west of the existing bridges.

This concept indirectly impacts the Historic I-5 Columbia River Bridge by building a new structure adjacent to it. Concept 6 has less impact to the bridges than Concept 4. The

existing northbound bridge is registered on the National Register of Historic Places and the southbound bridge is eligible for registration.

This concept would require evaluation to determine if the new bridge(s) substantially impair the historic integrity of the historic bridges.

EIA Option 3C

EIA Option 3C is most similar to BIA Concept 6, and therefore impacts to cultural resources associated with this option and discussed in the EIA are included here. This option is likely to have indirect impacts to the historic Columbia River Interstate Bridge associated with nearby construction activity or other work-related activities. It is also likely to have indirect impacts to five properties in Vancouver, including the First Christian Church, Hidden Houses, and three residences. It is also likely to have minor impacts to four properties in Washington, including the Fort Vancouver Historical Site, Koplan's Furnishings, the Spic 'n' Span, and Luepke Flowers.

Option 3 was evaluated in relation to state and local policies and ordinances, and found to be consistent with policies calling for the preservation of historic properties.

Option 6 "Express Bus with Capacity Increase" (six-lane)

EIA Option 6 (6-Lane Variation) is most similar to BIA Concept 6. Kiggins House (described under BIA Concept 4) and the House of Providence (described under BIA Concept 1) may experience minor impacts that are unlikely to aversely impact the properties.

The Columbia River Interstate Bridge may experience indirect impacts associated with nearby construction and other project-related activities. The Columbia Cemetery is likely to experience indirect impacts associated with this option.

Option 6 (6-Lane Variation) could conflict with Oregon state and local historic preservation policies, as the option has indirect impacts on the historic Columbia River Crossing Bridge. Pursuit of this option would necessitate a Section 106 and Section 4(f) process. This process would also need to be followed for impacts to the Kiggins House.

Option 8

No impacts to identified historic properties were identified in the EIA or the Cultural Resources Technical Report with this option.

BIA Concept 7

BIA Concept 7 has an encroachment onto the Ft. Vancouver Historical Site (60-120 feet). An encroachment over 60' would impact the FHWA building located near the SR 14 ramp to I-5 northbound. However, the BIA Summary Report indicates no historic buildings would be impacted. This concept includes two new bridge structures, one to the east of the existing bridges and one to the west. This has greater impacts to the Fort Vancouver Historic Site than those concepts with a structure to the east of the existing bridges.

This concept indirectly impacts the Historic I-5 Columbia River Bridge, though not to the extent of Concept 4. The existing northbound bridge is registered on the National Register of Historic Places and the southbound bridge is eligible for registration. Concept 7 would

undergo study to determine if the new bridges substantially impair the historic integrity of the historic bridges.

BIA Concept 8

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Cultural Resource Issues

The following potential issues were identified in relation to Cultural Resources:

- If a listed historic or cultural resource is impacted, Section 106 of the National Historic Preservation Act (NHPA) would require that ODOT and WSDOT take in to account the effect of the project on the property, and the Advisory Council on Historic Preservation (ACHP) must be given the opportunity to independently comment on the impact.
- The Fort Vancouver Historic Site is listed as a National Historic Landmark. Section 110 of the NHPA specifies that impacts to National Historic Landmarks must be minimized.
- Section 4(f) of the Department of Transportation Act of 1966 requires that before impacting a historic property, the agency determine that there are no feasible or prudent concepts before mitigation could be determined.
- Local and regional plans also include goals and policies related to properties of historic or cultural significance, with the intent of preserving these properties. Impacts related to the various concepts may conflict with local and regional goals and policies.
- There is potential for archaeological findings in the study area, perhaps by Fort Vancouver.

Visual

No visual analysis has been conducted to date.

BIA Concept 1

BIA Concept 1 includes construction of a new low- to mid-level bridge west of the existing bridges, with a lift span. No visual analysis has been conducted to date though the new structure could have visual impacts related to its height, the fact that it is a decked structure, and its style of design in relation to the existing historic structures.

BIA Concept 2

BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7. This is discussed in a later section.

BIA Concept 3

BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 was discussed in a previous section.

BIA Concept 4

BIA Concept 4 replaces the existing structures with one double deck mid- to high-level bridge and a separate new bridge for light rail. No visual analysis has been conducted to date on this concept. Typically a taller structure could have the potential for greater visual impacts than a low structure. In addition, the construction of two separate bridges as part of this concept could increase visual impacts.

BIA Concept 5

Concept 5 was not analyzed in the Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

BIA Concept 6 constructs one new low- to mid-level bridge with a lift span, to be used as a collector-distributor bridge with LRT. No visual analysis has been conducted. However, the new structure could have visual impacts related to its height, the fact that it is a decked structure, and its style of design in relation to the existing historic structures.

BIA Concept 7

BIA Concept 7 constructs two new structures, one east and one west of the existing bridges. The westernmost structure would be a low-to mid-level bridge with a lift span, to be used for LRT with northbound and southbound vehicle movement. The easternmost structure would be a low-to mid-level bridge with a lift span, to accommodate the northbound freeway traffic.

No visual analysis has been conducted for this Concept. However, the number of additional structures is greater than other concepts and could have a visual impact. In addition, the existing structures will be retained; if the new structures are of a different design than the existing historic bridges this could have a visual impact as well.

BIA Concept 8

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Visual Resource Issues

A visual resource analysis would be required for the concepts under consideration as part of the NEPA process. Generally, projects that have the greatest potential for negative visual impacts have new alignments, additional lanes, changes in vertical or horizontal alignments, new structures, large cuts or fills, waterway changes, and any changes to existing parkways or scenic byways. The Columbia River Crossing includes scenic views of the river, mountain peaks, and downtown Portland and Vancouver. Some expected issues include:

- New bridge lift structures, trusses, or arches may partially obstruct scenic views by travelers and off-road viewers.
- Higher bridges may have greater visual impact

- Double-deck structures may partially obstruct scenic views by travelers on the lower deck.
- If a tunnel option were pursued, it would wholly eliminate scenic views by travelers and could impact the visual intactness of the landscape.
- Multi-lane roadways may partially restrict travelers' scenic views of the river from middle lanes.
- Changes to alignments may change existing scenic views by travelers and off-road viewers or provide entirely new views.
- Construction activities may include temporary visual impacts from cranes, scaffolding, forms, earthwork, and so on.
- Because the existing I-5 bridges are historic structures, if new supplemental structures were of a different design, the visual unity of the Columbia Crossing could be impacted.

Noise

No noise analysis has been conducted to date.

BIA Concept 1

BIA Concept 1 includes construction of a new low- to mid-level bridge west of the existing bridges, with a lift span. No noise analysis has been conducted to date. The new structure may have noise impacts on businesses and residential locations to the west of the existing structure.

BIA Concept 2

BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7. This is discussed in a later section.

BIA Concept 3

BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 was discussed in a previous section.

BIA Concept 4

BIA Concept 4 replaces the existing structures with one double deck mid- to high-level bridge and a separate new bridge for light rail. No noise analysis has been conducted to date. The new structures may have noise impacts on businesses and residential locations near the footprint of the bridges.

BIA Concept 5

Concept 5 was not analyzed in the Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

BIA Concept 6 constructs one new low- to mid-level bridge with a lift span west of the existing structures, to be used as a collector-distributor bridge with LRT. No noise analysis has been conducted to date. The new structure may have noise impacts on businesses and residential locations to the west of the existing structure.

BIA Concept 7

BIA Concept 7 constructs two new structures, one east and one west of the existing bridges. The westernmost structure would be a low-to mid-level bridge with a lift span, to be used for LRT with northbound and southbound vehicle movement. The easternmost structure would be a low-to mid-level bridge with a lift span, to accommodate the northbound freeway traffic. No noise analysis has been conducted for this Concept. Noise impacts may be observed near the new structures.

BIA Concept 8

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Noise Issues

A detailed noise analysis would be required for the concepts under consideration as part of the NEPA process. The following issues may be of interest for this project:

- The BIA is currently subject to high noise levels from the existing freeway
- Industrial uses in Columbia Boulevard vicinity and Hayden Island are not likely to be noise-sensitive
- More traffic, associated with greater road capacity, will lead to greater noise impacts
- Noise sensitive locations are more likely to be located in Washington than Oregon, where the freeway passes near historic structures, commercial businesses, and residences in Vancouver.
- Noise can be a "constructive use" of a public park if it interferes with the appropriate use of the park
- Noise walls would be primarily constructed to protect "outdoor use areas"

Air Quality

A first-level air quality impact screening was conducted in 2001 and included in the EIA. The impact screening provided a general analysis of air quality impacts associated with the various options under consideration. Impacts were described for the I-5 corridor as a whole (Rose Quarter to I-205). Although three corridor segments were explored for more spot-based analysis, none of these segments were within the BIA. Impacts were assessed for both freeway mainline emissions as well as arterial screenline emissions.

The following pollutant emissions were analyzed:

- CO = Carbon Monoxide, a colorless, odorless, poisonous gas that reduces the blood's oxygen-carrying capability.
- VOC = Volatile Organic Compounds, a compound that, with NO_x produces ozone. Ozone causes eye irritation and respiratory tract irritation, and contributes to smog.
- NO_x = Nitrogen Oxides, a compound that, with VOC, produces ozone.
- PM_{10} = Particulate Matter, less than 10 micrometers in size, small particles of dust, soot, and organic matter suspended in the atmosphere. Particulate Matter may carry absorbed toxic substances.

The assessment identified potential total daily pollutant emissions that could result from the various options under consideration. General findings from the corridor-wide analysis are included in this section, organized by EIA Option. The BIA contained no additional air quality analysis.

BIA Concept 1

The BIA Summary Report did not describe air quality impacts. This Concept is most similar to EIA Option 6 (four-lane supplemental bridge), which is described below.

EIA Option 6 "Express Bus with Capacity Increase" (four-lane)

The first-level screening air quality analysis was conducted for Option 6 with the six-lane supplemental bridge variation, but not for the four-lane supplemental bridge variation or the ten-lane replacement bridge variation. The results of this analysis are described under BIA Concept 7.

The four-lane supplemental bridge variation of Option 6 has less capacity than the six-lane variation. Overall, the air quality screening found that lower capacity led to fewer localized emissions. It is therefore assumed that the four-lane bridge variation would have fewer localized emissions than the six-lane variation, though the actual amount is unknown.

BIA Concept 2

BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7. As discussed in a later section.

BIA Concept 3

BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 was discussed in a previous section.

BIA Concept 4

EIA Option 6 "Express Bus with Capacity Increase" (ten-lane)

The first-level screening air quality analysis was conducted for Option 6 with the six-lane supplemental bridge variation, but not for the ten-lane replacement bridge variation or the four-lane supplemental bridge variation. The results of this analysis are described under BIA Concept 7.

The ten-lane replacement bridge variation of Option 6 has less capacity than the six-lane supplemental bridge variation. Overall, the air quality screening found that lower capacity led to fewer localized emissions. It is therefore assumed that the four-lane bridge variation would have fewer localized emissions than the six-lane variation, though the actual amount is unknown.

BIA Concept 5

Concept 5 was not analyzed in the Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

The BIA Summary Report did not describe air quality impacts. This Concept is most similar to EIA Option 3C (light-rail loop), and EIS Option 8 (West Arterial Road) which are described below.

EIA Option 3C

The air quality analysis showed a high level of freeway emissions in comparison to the baseline for the light rail loop option. These freeway emissions were comprised of CO, VOC, NO_x, and PM_{10}. Option 3C showed a 15 percent increase in CO, a 66 percent increase in VOC, a 14 percent increase in NO_x, and a 6 percent increase in PM_{10}. These increases in freeway emissions were typical for options adding capacity on the bridge crossing.

Arterial screenline emissions displayed less of a difference, varying between 7 and 9 percent higher than the baseline. See Table 19 below.

TABLE 19
Option 3 Air Quality Impacts (Corridor-Wide)

ARTERIAL SCREENLINE EMISSIONS		
Pollutant	**Baseline - Daily Emissions (Kilograms/Day)**	**Option 3 Daily Emissions (Kilograms/Day)**
CO	3,534	3,815
VOC	140	151
NO_x	131	141
PM_{10}	34	37

TABLE 19
Option 3 Air Quality Impacts (Corridor-Wide)

FREEWAY EMISSIONS		
Pollutant	**Baseline - Daily Emissions (Kilograms/Day)**	**Option 3 Daily Emissions (Kilograms/Day)**
CO	11,888	13,655
VOC	393	651
NO_x	435	497
PM_{10}	106	112

Option 8

The West Arterial Option observed the highest arterial screenline pollutant emissions, with between 19 and 21 percent higher emissions than the baseline. However, the freeway emissions are much closer in line with the baseline condition than other options. See Table 20.

TABLE 20
Option 8 Air Quality Impacts (Corridor-Wide)

ARTERIAL SCREENLINE EMISSIONS		
Pollutant	**Baseline - Daily Emissions (Kilograms/Day)**	**Option 8 Daily Emissions (Kilograms/Day)**
CO	3,534	4,317
VOC	140	167
NO_x	131	159
PM_{10}	34	41
FREEWAY EMISSIONS		
Pollutant	**Baseline - Daily Emissions (Kilograms/Day)**	**Option 8 Daily Emissions (Kilograms/Day)**
CO	11,888	11,918
VOC	393	394
NO_x	435	436
PM_{10}	106	107

BIA Concept 7

The BIA Summary Report did not describe air quality impacts. This Concept is most similar to EIA Option 6 (six-lane supplemental bridge variation) which is described below.

6-lane supplemental bridge variation of EIA Option 6

The air quality analysis was conducted for Option 6 with the six-lane supplemental bridge variation. This option displayed the highest freeway pollutant emissions of all options studied, with emissions between 16 and 66 percent greater than the baseline. This option observed arterial screenline emissions that were between six and seven percent higher than the baseline. See Table 21 below.

TABLE 21
Option 6 Air Quality Impacts (Corridor-Wide)

ARTERIAL SCREENLINE EMISSIONS		
Pollutant	**Baseline - Daily Emissions (Kilograms/Day)**	**Option 6 Daily Emissions (Kilograms/Day)**
CO	3,534	3,793
VOC	140	148
NO_x	131	140
PM_{10}	34	36
FREEWAY EMISSIONS		
Pollutant	**Baseline - Daily Emissions (Kilograms/Day)**	**Option 6 Daily Emissions (Kilograms/Day)**
CO	11,888	14,818
VOC	393	651
NO_x	435	539
PM_{10}	106	123

BIA Concept 8

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Air Quality Issues

Regardless of which concept is considered, the air quality report concluded that air quality in the future is expected to be cleaner than it is today for all emissions but Particulate Matter. This is due to an expectation that vehicles will have lower emissions and burn cleaner fuels, as well as the anticipation that air quality maintenance plans will continue to be implemented. Location-specific air quality modeling, based on engineering design of the

project concepts, would be required during the NEPA process to identify more precise air quality impacts.

- Options that minimize traffic are likely to have the least negative impacts on air quality. Because automobiles are the primary producer of the pollutant CO, when mobility decreases (associated with greater traffic volumes in relation to capacity) cars take longer to pass through a given area, thereby releasing more CO. Additionally, idling engines are known for releasing higher levels of CO. In addition, in the Air Quality analysis specific localized emissions increased with additional road capacity. For this reason, road capacity needs to be considered in conjunction with mobility when choosing among concepts.
- Air quality is likely to be a sensitive issue with neighborhood residents in North Portland and Vancouver. The air quality issues that will need to be addressed to respond to public concerns range from regulatory to policy.
- Air quality conformity, air toxics, environmental justice, human health risk, CO hot spots, and Ozone impacts are all areas to be analyzed in the NEPA process.

Natural Resources

The Natural Resource Technical Report I-5 Trade Corridor Study represents a good approach to screening of potential options for natural resources impacts, particularly wetlands, and provides useful baseline information on the corridor; however, the difference and variations in design options reviewed in the Natural Resource Technical Report versus those in the BIA Summary Draft limits the direct applicability of the impact analysis to future EIS analysis (as well as the work completed for this report). Likewise, some of the information collected for the Natural Resource Technical Report, which was published in 2001, will need to be updated because of to the availability of new or more accurate information.

The BIA analysis in this report focuses on the eight BIA Concepts between Columbia Boulevard and SR-500 included in the BIA Summary Report. This report use information about BIA Concepts 1, 4, 6, and 7 to posit impacts that might result from the other concepts. The following analysis was based on review of aerial photographs of the project area with an overlay of the alignments and supporting text from BIA Summary Draft (Maps 2, 3, 4, and 5). The project maps (photographs) of Washington provided a much greater level of detail than the Oregon maps (photographs) due to their larger scale, and therefore provided better visibility of natural resources that would be impacted.

The BIA analysis did not provide a detailed analysis regarding potential impacts to natural resources, but did provide a limited analysis focusing on potential impacts to aquatic, wetland, and terrestrial habitat in the vicinity of the Columbia River. The primary areas of concern include the Columbia River, North Portland Harbor, the Columbia Slough, and the wetland mitigation site known as the former radio towers site (south of Marine Drive and west of I-5 in Oregon). The BIA Concepts and the three additional options studied included additional crossings of the Columbia River, North Portland Harbor, and the Columbia Slough. An analysis of potential natural resource impacts by concept follows.

Aquatic Resources

Impacts to aquatic resources of specific concern are limited to impacts to fish and fish habitat. Anadromous and resident fish and macroinvertebrate species are potentially at risk from proposed improvements presented in the four concepts. Anadromous and resident fish would likely include salmon and trout that may be federally or state-listed as threatened or endangered, or are candidates for listing. Macroinvertebrates could also be impacted. Fish habitat includes riparian habitat around streams and rivers. Removal of vegetation within a watershed, especially within a riparian zone, has the potential to increase sedimentary runoff from land. In addition, noise and vibration from construction equipment could temporarily negatively impact the behavior of salmonids and other organisms inhabiting the area, and could impede migration, halt normal daily activities (feeding, spawning, resting), or induce territorial out-migration.

The areas of impacts to aquatic resources include bridge and arterial crossings over the Columbia River, North Portland Harbor, and the Columbia Slough. Final design of bridge type, including the number of bridges and the number and placement of piers and abutments, will determine the extent of the impacts. Also important to determining construction impacts is the number of bridges across the Columbia River to be removed.

BIA Concept 1

BIA Concept 1 involves constructing a new southbound bridge crossing the Columbia River directly west of the existing I-5 Bridge, a bridge and arterial crossing North Portland Harbor, and a bridge and arterial crossings over the Columbia Slough. Impacts to aquatic resources would depend on the number and placement of piers and abutments, but are expected to be moderate in extent.

BIA Concept 2

Although BIA Concept 2 was not presented in detail in the BIA Summary Draft, Concept 2 is likely to have impacts to Columbia River resources most similar to BIA Concept 7 because both concepts result in two new bridges (with similar footprints) and a total of four bridges across the river. Roadway design south of the bridge crossing was not presented in the BIA Summary Draft for Concept 2, but impacts to North Portland Harbor and Columbia Slough are presumed to be most similar to Concept 7. (BIA Concept 7 is discussed later.)

BIA Concept 3

BIA Concept 3 was not presented in detail in the BIA Summary Draft. In terms of post-construction impacts to Columbia River resources, BIA Concept 3 is likely to have impacts most similar to BIA Concept 4 because both result in two bridges across the river. (Concept 4 is discussed later.) In terms of potential construction impacts to Columbia River resources, BIA Concept 3 is most similar to Concept 1 because one new 5-lane bridge is to be constructed; however, Concept 3 differs slightly because one current bridge is to be removed under Concept 3. Roadway design south of the bridge crossing was not presented in the BIA Summary Draft for Concept 3, but impacts to North Portland Harbor and Columbia Slough are presumed to be most similar to Concept 1. (BIA Concept 1 was discussed previously.)

BIA Concept 4

BIA Concept 4 includes a 10-lane double-deck replacement for the I-5 Bridge, with LRT on a separate new bridge crossing the Columbia River; a bridge crossing North Portland Harbor; a possible connector at Hayden Island, and a bridge over the Columbia Slough. Moderate impacts to aquatic resources are expected on the Columbia River, Columbia Slough, and North Portland Harbor.

BIA Concept 5

Although BIA Concept 5 was not presented in detail in the BIA Summary Draft, this concept is likely to have impacts to the Columbia River resources similar to BIA Concept 7 because both result in two new bridges for a total of four bridges across the river. Roadway design south of the bridge crossing was not presented in the BIA Summary Draft for Concept 5, but impacts to North Portland Harbor and Columbia Slough are presumed to be most similar to Concept 7. (BIA Concept 7 is discussed later.)

BIA Concept 6

BIA Concept 6 includes a new 4-lane supplemental collector-distributor bridge with LRT crossing the Columbia River; a southbound I-5 bridge and arterial crossing North Portland Harbor; ramp construction near the radio tower wetland mitigation site; and multiple bridges over the Columbia Slough. Moderate impacts to aquatic resources are expected on the Columbia River, Columbia Slough, North Portland Harbor, and Hayden Island.

BIA Concept 7

BIA Concept 7 includes a new northbound bridge and LRT crossing the Columbia River; an concept LRT crossing to Hayden Island, then to Marine Drive; an concept connector from Hayden Island to Marine Drive; and multiple bridges over the Columbia Slough. Aquatic resources that are associated with the Columbia River, Hayden Island, North Portland Harbor, and the Columbia Slough would be moderately impacted.

BIA Concept 8

BIA Concept 8 was not presented in detail in the BIA Summary Draft. It is likely to have impacts to Columbia River resources similar to BIA Concept 1 because both result in one new bridge (except the Concept 8 bridge has several more travel lanes) for a total of three bridges across the river. Concept 1 was discussed previously. Roadway design south of the bridge crossing was not presented in the BIA Summary Draft for Concept 8, but impacts to North Portland Harbor and Columbia Slough are presumed to be most similar to Concept 7. (BIA Concept 7 was discussed previously.)

Wetland Resources

Impacts to wetland resources would include direct impacts due to fill, clearing and grubbing of vegetation, and potential soil compaction that could alter hydrology. In addition, construction staging areas could lead to erosion and increased sedimentation resulting from vegetation removal and fill that could enter wetlands and impair water quality. Accidental leaks from fuel and oil tanks and improperly disposed stormwater could enter wetlands and impair water quality and damage wetland plants and wildlife.

Construction noise and increased human activity would temporarily disrupt wildlife associated with wetlands.

The areas of wetland resources that could be impacted are limited to the radio tower wetland mitigation site, potential wetland along the Columbia Slough, potential wetland adjacent to North Portland Harbor, and potential wetland on Hayden Island. However, at this level of analysis, it is not clear if wetland exists in areas other than the radio tower wetland mitigation site.

BIA Concept 1

BIA Concept 1 involves constructing a new southbound bridge crossing the Columbia River directly west of the existing I-5 Bridge; a bridge and arterial crossing North Portland Harbor; and multiple bridges over the Columbia Slough. Impacts to wetland resources would depend on the number and placement of abutments relative to wetland location. It is unlikely that there is wetland along the Columbia River, Hayden Island, or North Portland Harbor; if wetland does exist in these areas, the impacts are expected to be minor. Wetland may exist along the Columbia Slough, but impacts are expected to be minor depending on design and placement and number of abutments.

BIA Concept 1 also involves construction of a southbound on-ramp that would impact the radio tower wetland mitigation site. Wetland impacts would be limited to direct fill on the eastern part of the mitigation site.

BIA Concept 2

BIA Concept 2 was not presented in detail in the BIA Summary Draft. Roadway design was not presented in the BIA Summary Draft for Concept 2, but based on the bridge crossing design, impacts to wetland resources are presumed to be most similar to Concept 7. (BIA Concept 7 is discussed later.)

BIA Concept 3

BIA Concept 3 was not presented in detail in the BIA Summary Draft. Roadway design was not presented in the BIA Summary Draft for Concept 3, but based on the bridge crossing design, impacts to wetland resources are presumed to be most similar to Concept 1. (BIA Concept 1 was discussed previously.)

BIA Concept 4

BIA Concept 4 includes a 10-lane double-deck replacement for the I-5 Bridge, with LRT on a separate new bridge crossing the Columbia River; a bridge crossing North Portland Harbor; a possible connector at Hayden Island; and a bridge over the Columbia Slough. Minor impacts to wetland are possible on the Columbia River, Columbia Slough, and Hayden Island, although the extent of wetland habitat is not known. There appear to be no impacts to the radio tower wetland mitigation site with this concept.

BIA Concept 5

BIA Concept 5 was not presented in detail in the BIA Summary Draft. Roadway design was not presented in the BIA Summary Draft for Concept 5, but based on the bridge crossing

design, impacts to wetland resources are presumed to be most similar to Concept 7. (BIA Concept 7 is discussed later.)

BIA Concept 6

BIA Concept 6 includes a 4-lane supplemental collector-distributor bridge with LRT crossing the Columbia River; a new southbound I-5 bridge and arterial crossing North Portland Harbor; ramp construction near the radio tower wetland mitigation site; and multiple bridges over the Columbia Slough. Minor impacts to wetland are possible on the Columbia River, Columbia Slough, and Hayden Island, although the extent of wetland habitat is not known. The radio tower wetland mitigation site would be impacted due to fill, but construction of a retaining wall would reduce impacts.

BIA Concept 7

BIA Concept 7 includes a new northbound bridge and a LRT crossing the Columbia River; an alternative LRT crossing to Hayden Island, then to Marine Drive; an alternative connector from Hayden Island to Marine Drive; multiple bridges over the Columbia Slough; and a bridge over the radio tower wetland mitigation site. Wetlands could be impacted along the Columbia River, Hayden Island, the radio tower wetland mitigation site, and along the Columbia Slough, but would be expected to be minor in extent.

BIA Concept 8

BIA Concept 8 was not presented in detail in the BIA Summary Draft. Roadway design was not presented in the BIA Summary Draft for Concept 8, but based on the bridge crossing design, impacts to wetland resources are presumed to be most similar to Concept 7. (BIA Concept 7 was discussed previously.)

Terrestrial Resources

Impacts to terrestrial resources of specific concern are primarily limited to fills and direct loss of plants and wildlife. Construction equipment and vehicles could also impact vegetation depending on staging area location, size, and action. The location and construction of stormwater facilities will likely impact terrestrial resources. Trees that would be retained near the project corridor and new alignments could have roots partially severed or excavated during construction. With the addition of asphalt, soil temperatures may be expected to increase, thereby affecting nearby plant survival by reducing the area in which water enters the soil and becomes available to plant roots. If water availability is insufficient in the smaller growing space, plant survival could be compromised. Impacts to plant communities are limited to developed/ornamental landscaping and limited forest habitat. Developed/ornamental landscape can include both native and non-native trees and shrubs planted for aesthetics near developed areas.

Wildlife could be impacted by direct loss of habitat. Smaller, less mobile species and those seeking refuge in burrows (e.g. voles, gophers, and snakes) could be killed inadvertently during construction activities along the I-5 corridor. Mobile species, such as songbirds and crows, could be temporarily displaced from suitable habitat in the immediate vicinity of the study corridor. Building new roadway and widening existing roadway would result in an increase in wildlife barriers and increase habitat fragmentation. Impacts to wildlife may include the bald eagle, heron species, and osprey, which use the Columbia River for feeding

and the shoreline for nesting and perching. There are documented bald eagle nests in the vicinity of the study area, and bald eagles overwinter in this area. The bald eagle is a federal and state threatened species. Bat species may use forested habitats. In addition, birds and small mammals that inhabit landscaped and forested habitats could be negatively affected.

Improvements to the SR-500 interchange near Leverich Park, widening of I-5 and arterial overpasses, and the redesign of SR-14 and I-5 interchange could impact terrestrial habitats in those areas.

BIA Concept 1

There are multiple elements to this design that have potential for impacts to terrestrial resources throughout the study area:

- BIA Concept 1 would involve construction of a northbound on-ramp to I-5 at SR-500 and Leverich Park in the northeast corner of SR-500 and I-5 interchange, and a new flyover ramp from SR-500 westbound to I-5 southbound. This concept could impact developed/ornamental and forest habitats in the vicinity of Leverich Park. Minor loss of habitat could displace the small mammals and birds that use this area. Removal of the current southbound I-5 on-ramp from 39th Street would result in a revegetated area with shrubs and groundcover.
- BIA Concept 1 involves widening two overpasses (East 33rd and East 29th Streets) between SR-500 and Fourth Plain Boulevard, and widening the Fourth Plain Boulevard overpass. Impacts would be limited to developed/ornamental landscaping, including shrubs and grass, and could kill or displace small mammals and birds, but would be minor in extent. The Mill Plain and Evergreen Boulevard overpasses would also be widened. Fill likely already exists here. Impacts would be limited to shrubs and grass, and could kill or displace rodents and birds.
- BIA Concept 1 involves widening I-5. However, constructing walls in some areas would reduce vegetation and wildlife impacts. Minor impacts to plants and wildlife would be limited to the removal of shrubs and grass and could kill or displace small mammals and birds.
- BIA Concept 1 involves a redesign of the SR-14 and I-5 interchange. Widening SR-14, constructing an overpass, and constructing a bridge ramp to northbound I-5 could impact grassland and shrubs and could kill or displace small mammals and birds.
- BIA Concept 1 includes a new 5-lane southbound supplemental bridge with LRT that would cross the Columbia River directly west of the existing I-5 Bridge. This concept could impact developed ornamental landscaping on Hayden Island, and may include both native and non-native trees and shrubs.

BIA Concept 2

BIA Concept 2 was not presented in detail in the BIA Summary Draft. Roadway design was not presented in the BIA Summary Draft for Concept 2, but based on the bridge crossing design, impacts to terrestrial resources are presumed to be most similar to Concept 7. (BIA Concept 7 is discussed later.)

BIA Concept 3

BIA Concept 3 was not presented in detail in the BIA Summary Draft. Roadway design was not presented in the BIA Summary Draft for Concept 3, but based on the bridge crossing design, impacts to wetland resources are presumed to be most similar to Concept 1. (BIA Concept 1 was discussed previously.)

BIA Concept 4

There are multiple elements to this design that have potential for impacts to terrestrial resources throughout the study area:

- BIA Concept 4 would involve construction of a northbound on-ramp to I-5 at SR-500 and Leverich Park in the northeast corner of the SR-500 and I-5 interchange, and a new flyover ramp from SR-500 eastbound to I-5 southbound. This concept could impact developed/ornamental and forest habitats in the vicinity of Leverich Park. Minor loss of habitat could displace the small mammals and birds that use this area. Removing the current southbound I-5 on-ramp from 39th Street would result in a revegetated area with shrubs and groundcover.
- BIA Concept 4 involves widening two overpasses (East 33rd and East 29th Streets) between SR-500 and Fourth Plain Boulevard, widening the Fourth Plain Boulevard overpass, and constructing a new southbound I-5 access to Mill Plain Boulevard. Impacts would be limited to developed/ornamental landscaping, including shrubs and grass, and could kill or displace the small mammals and birds that may use the shrubs and grass that would be removed, but these impacts would be minor in extent. The Mill Plain and Evergreen Boulevard overpasses would also be widened. Fill likely already exists here. Impacts would be limited to shrubs and grass and could kill or displace small mammals and birds.
- BIA Concept 4 involves widening I-5. However, constructing walls in some areas would reduce vegetation and wildlife impacts. Construction of new southbound I-5 lanes near Mill Plain would remove developed/ornamental landscape, including trees and shrubs. Minor impacts to plants and wildlife would be limited to the removal of trees, shrubs, and grass and loss of associated small mammals and displaced birds.
- BIA Concept 4 involves a redesign of the SR-14 and I-5 interchange. Widening SR-14, constructing an overpass, and constructing a bridge ramp to northbound I-5 could impact grassland and shrubs and could kill or displace small mammals and birds.
- BIA Concept 4 includes a 10-lane double-deck replacement for the existing I-5 Bridge with LRT, and a separate new bridge crossing the Columbia River; a possible connector at Hayden Island; and a bridge over the Columbia Slough that could impact developed ornamental landscaping on the Washington side near Columbia Street and on Hayden Island, and may include both native and non-native trees, shrubs, and grass.

BIA Concept 5

BIA Concept 5 was not presented in detail in the BIA Summary Draft. Roadway design was not presented in the BIA Summary Draft for Concept 5, but based on the bridge crossing

design, impacts to wetland resources are presumed to be most similar to Concept 7. (BIA Concept 7 is discussed later.)

BIA Concept 6

There are multiple elements to this design that have potential for impacts to terrestrial resources throughout the study area:

- BIA Concept 6 would involve constructing a northbound on-ramp to I-5 at SR-500 and Leverich Park; a new flyover ramp from I-5 southbound to SR-500 eastbound; widening East 39th Street; and constructing a bridge to connect westbound SR-500 to southbound I-5. This concept could impact developed/ornamental and forest habitats in the vicinity of Leverich Park. Minor loss of habitat could displace the small mammals and birds that use this area. Removal of the current southbound I-5 on-ramp from 39th Street would result in a revegetated area with shrubs and groundcover.
- BIA Concept 6 involves widening two overpasses (East 33rd and East 29th Streets) between SR-500 and Fourth Plain Boulevard, widening the Fourth Plain Boulevard overpass, and constructing new southbound I-5 lanes. Impacts would be limited to developed/ornamental landscaping, including shrubs and grass, and could kill or displace small mammals and birds, but these impacts would be minor in extent. The overpass at Mill Plain would also be widened. Fill likely already exists here. Impacts would be limited to shrubs and grass, and could kill or displace rodents and birds.
- BIA Concept 6 involves widening I-5. However, constructing walls in some areas would reduce vegetation and wildlife impacts. Construction of new southbound I-5 lanes near Mill Plain would remove developed/ornamental landscape that includes trees and shrubs. Minor impacts to plants and wildlife would be limited to the removal of trees, shrubs, and grass, and the loss of associated small mammals and displaced birds.
- BIA Concept 6 involves a redesign of the SR-14 and I-5 interchange. Widening SR-14 and constructing a bridge ramp to southbound I-5 could impact grassland and shrubs and could kill or displace small mammals and birds. Impacts to developed/ornamental landscape and associated small animals and birds are expected to be minor.
- BIA Concept 6 includes a 4-lane supplemental collector-distributor bridge with LRT crossing the Columbia River; a possible connector at Hayden Island; and a bridge over the Columbia Slough. This concept could impact developed ornamental landscaping on the Washington side near Columbia Street and on Hayden Island; this may include both native and non-native trees and shrubs. The new southbound I-5 lanes would cause minor impacts to Delta Park greenspace and result in minor loss of shrubs and grass and the associated displacement of small mammals and birds that use this area.

BIA Concept 7

There are multiple elements to this design that have potential for impacts to terrestrial resources throughout the study area:

- BIA Concept 7 would involve constructing a northbound on-ramp to I-5 at SR-500 and Leverich Park; a new flyover ramp from I-5 southbound to SR-500 eastbound; widening East 39th Street; and constructing a bridge to connect westbound SR-500 to southbound

I-5. This concept could impact developed, ornamental and forest habitats in the vicinity of Leverich Park. Minor loss of habitat could displace the small mammals and birds that use this area. Removing the current southbound I-5 on-ramp from 39th Street would result in a revegetated area with shrubs and groundcover.

- BIA Concept 7 involves widening two overpasses (East 33rd and East 29th Streets) between SR-500 and Fourth Plain Boulevard; widening the Fourth Plain Boulevard overpass; constructing a new southbound I-5 lane(s); and constructing a southbound I-5 bridge at Mill Plain. Impacts would be limited to developed and ornamental landscaping, including shrubs and grass, and could kill or displace small mammals and birds that may use the shrubs and grass that would be removed, but these impacts would be minor in extent. The overpass at Mill Plain would also be widened. Fill likely already exists here. Impacts would be limited to shrubs and grass and could kill or displace rodents and birds.
- BIA Concept 7 involves widening I-5. However, constructing walls in some areas would reduce vegetation and wildlife impacts. Constructing new southbound I-5 lanes near Mill Plain would remove developed and ornamental landscape that includes trees and shrubs. Minor impacts to plants and wildlife would be limited to the removal of trees, shrubs, and grass and the loss of associated small mammals and displaced birds.
- BIA Concept 7 involves a redesign of the SR-14 and I-5 interchange. Widening SR-14 and constructing a bridge ramp to southbound I-5 could impact grassland and shrubs, and could kill or displace small mammals and birds. Impacts to developed and ornamental landscape and associated small animals and birds are expected to be minor.
- BIA Concept 7 includes a new northbound bridge and LRT crossing the Columbia River; an alternative LRT crossing to Hayden Island, then to Marine Drive; an alternative connector from Hayden Island to Marine Drive; and multiple bridges over the Columbia Slough. Developed and ornamental landscape impacts would include both native and non-native trees and shrubs. The new southbound I-5 lanes would cause minor impacts to Delta Park greenspace and result in minor loss of shrubs and grass and the associated displacement of the small mammals and birds that use this area.

BIA Concept 8

BIA Concept 8 was not presented in detail in the BIA Summary Draft. Roadway design was not presented in the BIA Summary Draft for Concept 8, but based on the bridge crossing design, impacts to wetland resources are presumed to be most similar to Concept 7. (BIA Concept 7 was discussed previously.)

Potential Natural Resource Issues

As designed, the following impacts to key natural resources in the I-5 corridor study area as defined above were noted:

- *Aquatic Resources:* All BIA concepts have the potential for moderate impacts to fish habitat. Some concepts have more impacts than others, but all designs need to consider the impact to anadromous fish. Additionally, all BIA concepts would require permitting

under the federal Endangered Species Act (ESA) and Section 10 of the Rivers and Harbors Act.

- *Terrestrial Impacts:* Few significant terrestrial impacts were recognized as a result of this analysis and impacts were limited primarily to streetscape or small areas of native vegetation. However, detailed analysis in an EIS may result in identification of impacts to species or habitats not recognized in this or previous reviews due to the scale of the analysis.
- *Wetland Impact:* All concepts, except BIA Concept 4, would encroach onto the radio tower wetland site (100 to 240 feet depending on the concept). Impacts to mitigation sites can result in significant mitigation requirements although the impact proper may be small. Permitting for such impacts involves Sections 404 and 401 of the Clean Water Act, as well as state permitting through the Oregon Department of State Lands.

Hydrology, Hydraulics, Water Quality

No analysis has been conducted to date regarding hydrology, hydraulics, or water quality.

BIA Concept 1

BIA Concept 1 includes construction of a new low- to mid-level bridge west of the existing bridges, with a lift span. No hydrology, hydraulics, or water quality analysis has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 2

BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7. This is discussed in a later section.

BIA Concept 3

BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 was discussed in a previous section.

BIA Concept 4

BIA Concept 4 replaces the existing structures with one double deck mid- to high-level bridge and a separate new bridge for light rail. No hydrology, hydraulics, or water quality analysis has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 5

Concept 5 was not analyzed in the Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

BIA Concept 6 constructs one new low- to mid-level bridge with a lift span west of the existing structures, to be used as a collector-distributor bridge with LRT. No hydrology, hydraulics, or water quality analysis has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 7

BIA Concept 7 constructs two new structures, one east and one west of the existing bridges. The westernmost structure would be a low-to mid-level bridge with a lift span, to be used for LRT with northbound and southbound vehicle movement. The easternmost structure would be a low-to mid-level bridge with a lift span, to accommodate the northbound freeway traffic. No hydrology, hydraulics, or water quality analysis has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 8

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Hydrology, Hydraulics, and Water Quality Issues

A detailed analysis would be required for the alternatives under consideration as part of the NEPA process. The areas of impacts include bridge and arterial crossings over the Columbia River, North Portland Harbor, and the Columbia Slough. The following issues may be of interest for this project:

- Stormwater runoff from any new bridge structures would need to be collected and treated before discharging to the Columbia
- Placement of embankment material and revetment (scour protection) for the bridge abutments may impact riparian areas and wildlife habitat
- Increased runoff from the proposed development will not be a concern because this increase will be small in comparison to the flow in the Columbia
- The roadways leading up to the bridge may impact the existing drainage system and flow paths to wetlands, creeks, natural depressions in undeveloped areas or stormwater systems in urban areas.
- The Columbia River is designated as a 303(d) limited waterbody for several constituents, including temperature (summer only), PCB, DDT Metabolite, Arsenic, and Polynuclear Aromati. Stormwater runoff from the project will need to be sufficiently treated so as to not adversely affect the river. Several TMDLs have been developed to address these constituents. All construction/permitting will be impacted by TMDL requirements.
- A number of permits would be required, including a 401 Water Quality Certification from DEQ. ESA issues and permitting will be pertinent to the project.
- The project is likely to require a Section 9 U.S. Coast Guard bridge permit.

Hazardous Materials

No analysis of hazardous materials has been conducted to date.

BIA Concept 1

BIA Concept 1 includes construction of a new low- to mid-level bridge west of the existing bridges, with a lift span. No analysis of hazardous materials has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 2

BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7. This is discussed in a later section.

BIA Concept 3

BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 was discussed in a previous section.

BIA Concept 4

BIA Concept 4 replaces the existing structures with one double deck mid- to high-level bridge and a separate new bridge for light rail. No analysis of hazardous materials has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 5

Concept 5 was not analyzed in the Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

BIA Concept 6 constructs one new low- to mid-level bridge with a lift span west of the existing structures, to be used as a collector-distributor bridge with LRT. No analysis of hazardous materials has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 7

BIA Concept 7 constructs two new structures, one east and one west of the existing bridges. The westernmost structure would be a low-to mid-level bridge with a lift span, to be used for LRT with northbound and southbound vehicle movement. The easternmost structure would be a low-to mid-level bridge with a lift span, to accommodate the northbound freeway traffic. No analysis of hazardous materials has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 8

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Hazardous Materials Issues

A detailed analysis would be required for the alternatives under consideration as part of the NEPA process. The following issues may be of interest for this project:

- The levels and types of hazardous materials likely to be encountered within or adjacent to waterways increases as one moves toward the confluence of the Willamette and Columbia Rivers.
- North Portland is heavily industrialized through many of the likely corridor locations. Industrial uses in the project area are likely to have issues related to hazardous materials.
- Hazardous materials testing at multiple locations will be a given for any of the corridor locations under consideration. The levels of hazardous materials testing and analysis will be increasingly rigorous as the project moves further through planning and development processes.

Soils and Geology

No analysis of soils and geology has been conducted to date.

BIA Concept 1

BIA Concept 1 includes construction of a new low- to mid-level bridge west of the existing bridges, with a lift span. No analysis of soils and geology has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 2

BIA Concept 2 was not analyzed in the Summary report though the added footprint (five traffic lanes, two LRT lanes) is similar to BIA Concept 7. This is discussed in a later section.

BIA Concept 3

BIA Concept 3 was not analyzed for environmental impacts in the BIA Summary report, however it adds a five-lane bridge structure similar to BIA Concept 1. Concept 1 was discussed in a previous section.

BIA Concept 4

BIA Concept 4 replaces the existing structures with one double deck mid- to high-level bridge and a separate new bridge for light rail. No analysis of soils and geology has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 5

Concept 5 was not analyzed in the Summary report though the added footprint (six traffic lanes, two LRT lanes) is similar to BIA Concept 7. BIA Concept 7 is discussed in a later section.

BIA Concept 6

BIA Concept 6 constructs one new low- to mid-level bridge with a lift span west of the existing structures, to be used as a collector-distributor bridge with LRT. No analysis of soils and geology has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 7

BIA Concept 7 constructs two new structures, one east and one west of the existing bridges. The westernmost structure would be a low-to mid-level bridge with a lift span, to be used for LRT with northbound and southbound vehicle movement. The easternmost structure would be a low-to mid-level bridge with a lift span, to accommodate the northbound freeway traffic. No analysis of soils and geology has been conducted to date. General issues related to these areas that may arise during the NEPA process are discussed at the end of this section.

BIA Concept 8

Concept 8 was not analyzed in the BIA Summary report. It is most similar to BIA Concept 7, which is discussed in the previous section.

Potential Soils and Geology Issues

A detailed analysis would be required for the alternatives under consideration as part of the NEPA process. The following issues may be of interest for this project:

- The existing bridges do not meet current seismic standards and in the event of a major earthquake, they could fail. New bridges built to current standards would have a higher probability of withstanding a major earthquake.
- River sediments consist of sand, silt and gravel in varying proportions. Sediment depth varies but can be greater than 100 feet. Sediments are late Pleistocene to Holocene age remnants of the Missoula floods. The sediments in the river channel are young, unconsolidated materials. Upper portions of the sediments may be susceptible to liquefaction or slope failure during strong ground motion seismic events.
- If a tunnel option is pursued, it would need to be deep enough below the dredge prism so that there is enough overburden to hold themselves in place.